

**MIAMI UNIVERSITY
SCHOOL OF ENGINEERING AND APPLIED SCIENCE
DEPARTMENT OF ENGINEERING TECHNOLOGY**

ENT 412 Industrial Applications of Neural Networks and Fuzzy Logic 3
Course Number Title Credit Hours

PREREQUISITES BY COURSE:

STA 368 or STA 301 Statistics, and MTH 151 Calculus I.

DESCRIPTION

A coverage of the fundamentals and industrial applications of neural networks and fuzzy logic. Case Studies in process control and manufacturing systems are included. Periods per week : 2 Lecture Hours, and 2 Laboratory Hours.

GENERAL OBJECTIVES

The student will gain a practical understanding of modern expert systems from an application viewpoint. The student will know how and why fuzzy logic and neural networks are used for control and prediction in industry. They will also understand related topics such as multivariate statistics and parameter estimation is included.

TOPICAL OUTLINE

Session 1 Module 1 Introduction to Fuzzy Logic and Neural Networks.
Session 2 Module 2 Classical Set Theory.
Session 3 Lab 1
Session 4 Module 3 Fuzzy Set Theory.
Session 5 Lab 2
Session 6 Module 4 Fuzzy Algebra and Control.
Session 7 Fuzzy Logic Labs 3,4,5
Session 8 Module 5 Matrix Methods
Session 9 Module 6 Multivariate Regression.
Session 10-11 Module 7 Noise Filters
Session 12-13 Module 8 Perceptrons/Back Propagation Lab 6
Session 14 Module 9 ART/Kohonen/Hopfield Networks
Session 15 Neural Network Labs 7,8,9
Session 16 Final

TEXT MATERIAL:

Ibrahim, Introduction to Applied Fuzzy Electronics, Prentice Hall, 1997.

REFERENCES:

Bharath, R. Neural Network Computing, McGraw Hill, 1994.

Welstead, Stephen T., Neural Networks and Fuzzy Logic Applications in C/C++, Wiley, 1994.

Kasabov, Nikola, Foundations of Neural Networks, Fuzzy Systems, and Knowledge Engineering, MIT Press, 1996.

Mamdani, E.H. and Gaines, B.R., Fuzzy Reasoning and Its Applications, Academic Press, 1981.

PREREQUISITES BY TOPIC:

Statistics, differentiation and integration of single variables.

COMPUTER USAGE:

Experiments using Visual Basic, NeuralWare, Predict, and FUDGE.

LABORATORY PROJECT:

- Lab 1 Set Logic
- Lab 2 Fuzzy Membership Functions.
- Lab 3 Controlling a Car on an Icy Road.
- Lab 4 Tank Fill Lab.
- Lab 5 Inverted Pendulum.
- Lab 6 Back Propagation using Excel
- Lab 7 Predicting Operation of Hot Wire Cutter.
- Lab 8 Predicting Power Factor with a Neural Network.
- Lab 9 Predicting Water Usage.

METHOD OF PRESENTATION

Lecture, demonstration, problem solving, and related laboratory experiences will be integrated into the course. The student is encouraged to engage in dialogue as topics are presented and/or when understanding is not complete.

METHOD OF EVALUATION

- Test 1 15%
- Test 2 15%
- Test 3 15%
- Labs 15%
- Homework 10%
- Case Study 10%
- Final Exam 25%

Miami University Learning Community:

Miami University is committed to fostering a supportive learning environment for all students irrespective of individual differences in gender, race, national origin, religion, handicapping conditions, sexual preferences, or age. Students

should expect, and help create, a learning environment free from all prejudice. Disparaging comments, sexist or racist humor, or questioning the academic commitment of students based upon these individual differences are behaviors that undermine our learning community. If such behaviors occur in class, please seek the assistance of your instructor or department chair.

D. Hergert
8/05